CLAIMS

1. Apparatus for measuring package permeability and/or permeant sorption comprising:

a housing defining an inner sealed chamber, the housing being substantially impervious to a permeant of interest;

the sealed chamber having an inlet for introducing an inert medium substantially free of the permeant of interest into the chamber and an outlet for removing the inert medium from the chamber;

a sensor positioned within the sealed chamber and designed to provide signals, external of the chamber, indicative of permeant concentrations within the chamber; and

a sealable opening in the housing in communication with the chamber for introducing, within the chamber, packages and/or film samples to be measured for permeability and/or permeant sorption.

2. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 1 and further including temperature controlling apparatus associated with the chamber for controlling temperature within the chamber.

3. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 2 wherein the temperature controlling apparatus includes a temperature sensor positioned within the chamber.

4. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 3 wherein the temperature sensor includes one of a resistance thermometer, a thermistor, and a thermocouple.

5. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 2 wherein the temperature controlling apparatus includes heating and cooling apparatus.

6. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 5 wherein the heating and cooling apparatus is combined into a single element.

7. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 6 single heating and cooling element includes one of a thermoelectric and a Peltier device.

8. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 1 and further including humidity controlling apparatus associated with the chamber for controlling humidity within the cavity,

9. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 8 wherein the humidity controlling apparatus includes a container positioned within the chamber and containing a salt solution.

10. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 9 wherein the container includes a bag formed of a microporous hydrophobic material.

11. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 10 wherein the bag and the salt solution contained therein are pre-selected to maintain the chamber at a substantially constant humidity.

12. Apparatus for measuring package permeability and/or permeant sorption as claimed in claim 1 and further including agitation apparatus positioned in the chamber to substantially eliminate concentration gradients within the chamber.

13. A method of measuring permeability and/or permeant sorption comprising the steps of:

providing a housing impervious to a permeant of interest and defining an inner sealable chamber having an inlet for introducing into the chamber an inert medium substantially free of the permeant of interest and an outlet for removing from the chamber the inert medium, and a sensor positioned within the sealed chamber and designed to provide signals, external of the chamber, indicative of permeant concentrations within the chamber;

placing packages to be tested in the chamber, flushing the chamber with the inert medium using the inlet and outlet to reduce permeant concentration in the chamber to a suitable low limit, and sealing the chamber subsequent to flushing;

monitoring the sensor to determine when the permeant concentration in the chamber increases to a suitable high limit; and

recycling the flushing, sealing and monitoring steps a plurality of times to achieve a constant time versus permeant concentration slope between the low limit and the high limit.

14. The method of claim 13 wherein the suitable low limit is below a low sensitivity of the sensor.

15. The method of claim 13 wherein the suitable high limit is such that a partial pressure of the permeant in chamber is below a partial pressure of the permeant in the packages to be tested.

16. The method of claim 13 wherein the recycling step includes a step of recording time intervals for sensor signals to reach the high limit from the low limit and calculating a rate of permeation into the chamber from the time intervals.

17. The method of claim 13 wherein the recycling step includes periodically acquiring concentration data from the sensor signals and computing a rate of permeation using linear regression on a point-by-point basis within each measurement cycle.

18. The method of claim 13 wherein the monitoring step includes a sub-step of controlling at least one of humidity, temperature, and concentration gradients within the chamber during the monitoring step.

19. The method of claim 13 further including a step of varying temperature within the chamber during the measuring procedure according to a predetermined program to determine gross package integrity.

20. Apparatus for controlling humidity in a closed area comprising a salt solution contained in a microporous hydrophobic bag.

21. Apparatus for controlling humidity in a closed area as claimed in claim 20 wherein the salt solution contained in the bag includes saturated salt and an excess of undissolved salt.

22. Apparatus for controlling humidity in a closed area as claimed in claim 20 wherein the bag has a size and an amount and type of salt solution and excess undissolved salt contained therein calculated to maintain a selected humidity level in the closed area.

23. Apparatus for controlling humidity in a closed area comprising a piezoelectric water injection device, together with a humidity sensor and a controller for determining an amount of water to be injected depending on an observed humidity level and a desired control set point.